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Chalcomenite from Ballybunnion, Co. Kerry, Eire

THE rare copper selenite, chalcomenite ($CuSeO_3 \cdot 2H_2O$), has been identified on specimens from Ballybunnion, Co. Kerry, Eire, submitted independently to the two authors by the late Richard W. Barstow. The mineral forms bright blue transparent elongated crystals up to 0.4×0.15 mm in size but generally smaller, scattered singly or in radiating clusters on joint surfaces of a black shale. The crystals are mostly composed of several parallel intergrown individuals, but some are well defined prisms with simple pinacoidal terminations; doubly terminated prisms occur rarely. The X-ray powder pattern agreed with published data for chalcomenite (Mandarino, 1964; PDF 17-523), and the distinctive infrared absorption spectrum matched that of synthetic chalcomenite (Makatun *et al.*, 1970). Only copper and selenium were detected by energy-dispersive electron microprobe analysis.

The mineral was collected by Mr Barstow in May 1979 from a highly contorted shale bed at the base of coastal cliffs in a small bay NW of Doon East, *c.* 1.3 km north of Ballybunnion. In April 1982 this bed was covered by a large shingle bank and further material could not be obtained. The shales exposed on this part of the coast belong to the Clare Shales Formation (Upper Carboniferous, Namurian) and include highly pyritiferous and carbonaceous bands (Sevastopulo, 1981). Ainsworth (1834) described the occurrence in the shales north of Ballybunnion of disseminated pyrite, chalcopyrite and arsenopyrite, and of veins of chalcopyrite. Ainsworth also noted wavellite, melanterite, chalcanthite, and efflorescences of several aluminium sulphates which, from his somewhat confusing descriptions and chemical tests, may be supposed to have included potassium alum, halotrichite and/or pickeringite, and possibly alunogen (which Ainsworth named 'katharite'). Fine specimens of botryoidal wavellite collected from this area by Sir Arthur Russell in 1945 are in the British Museum (Natural History).

Friedel and Sarasin (1881) synthesised $CuSeO_3 \cdot 2H_2O$ by slow mixing at ordinary temperatures of solutions containing cupric and selenite ions, but noted that the form of the crystals differed from that of chalcomenite. We have grown well-formed blue prisms up to 2.5×0.6 mm in size in an inverted water-filled U-tube, the two ends of which were immersed for four months in dilute aqueous solutions of Na_2SeO_3 and $CuSO_4$, respectively; these crystals gave the X-ray powder pattern and infrared spectrum of chalcomenite. It seems likely that, at Ballybunnion, chalcomenite is being formed in a similar way, from copper and selenium leached from the shales. The Clare Shales formation can be markedly seleniferous; in Co. Limerick, samples of shale contained up to 30 p.p.m. selenium, and soils on or near the Clare Shales sub-outcrop contained up to 110 p.p.m. selenium (Webb and Atkinson, 1965). Highly seleniferous soils, toxic to grazing animals, also occur in other areas in Ireland (Fleming and Walsh, 1957; Kiely and Fleming, 1969), and it is possible that chalcomenite and perhaps other secondary selenium minerals will be found in such areas if a source of copper or other metals is also present.

Chalcomenite is new to the British Isles and is the first selenium mineral to be found in Ireland; several selenides have been reported recently from Coniston, Cumbria (Stanley and Vaughan, 1982) and Hope's Nose, Torquay, Devon (Criddle and Stanley, 1986).

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